inoculation of the lesion with large numbers of bacteria (Cipriani et al 1980, Malloy 1978). At least 3 genera of bacteria can produce presumptive shell disease using this technique (Cipriani et al 1980). This challenge with large numbers of bacteria, which may overwhelm normal host protective mechanisms, makes the true meaning of such results open to question.

We felt that these observations strongly suggested that it is the environment and not the presence of bacteria per se, that is responsible for the induction and development of shell disease. We hypothesized that it is not simply the presence of bacteria but the presence of some immunosuppressive event that compromises the crab's ability to control its endemic microflora. Further, we hypothesized that potent antibacterial compounds must be present in normal crabs that keep the normal bacterial flora in check, and that disease induction is a function of reduced antibacterial activity in crabs exposed to stressful environments.

The blue crab exoskeleton (cuticle) consists of three major layers: the epicuticle, the procuticle, and the epidermis (Stevenson 1985). The thin outer layer, the epicuticle, is characterized by the absence of chitin. It is principally composed of protein, lipid, and calcium salts. Beneath it is the thick procuticle, which is composed primarily of chitin, protein, and calcium salts. These two layers are secreted by an underlying epidermis, usually one cell layer thick.

One feature of the crustacean cuticle which differentiates it from the body surface of vertebrates is the acellular nature of the epicuticle and procuticle. This has important ramifications for the defense of the cuticle since it implies that humoral immunity (i.e., antimicrobial chemicals), not cell-mediated immunity, is what protects the cuticle against microbial invasion. While intact immune cells are not found within the cuticle, fine cytoplasmic extensions of the epidermal cells extend vertically through the cuticle in pore canals (Halcrow 1978). In addition, ducts of the tegumental glands also extend to the surface of the cuticle. The tegumental glands are situated just beneath the epidermis. These canals and ducts may serve as portals for supplying antimicrobial agents. Stagner and Redmond (1975) found that tegumental gland secretion of the horseshoe crab (Limulus polyphemus) could agglutinate red blood cells and algae, suggesting that it might also recognize pathogens. Agglutination, cytolysis, and related activities have been identified from a number of marine invertebrates, including crustaceans, but their role in fighting infection has not been precisely defined (Kinne 1980).

Invertebrates do not have a specific immune response (e.g., antibody) as found in the vertebrates, and thus cannot recognize